UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/270,780	03/17/1999	IKUO HIYAMA	503.36984X00	2934

20457 7590 06/01/2004

ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-9889

EXAMINER	
QI, ZHI QIANG	

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 06/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/270,780	HIYAMA ET AL.	
	Examiner	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 May 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-22,25,26,29,30,33 and 34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-22,25,26,29,30,33 and 34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 13 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 6,025,897 (Weber et al).

Claims 1, 13 and 20, AAPA discloses (background of the invention in the specification; conventional liquid crystal display device of Fig. 35) that a liquid crystal display device comprising:

- an illumination device (51,53,54,56) ;
- a light control element (40) arranged at a projected light side of the illumination device;
- a reflective polarizer (30) arranged at an upper portion of the light control element (40);
- the light control element (40) is the only light control element arranged between the illumination device (51,53,54,56) and the reflective polarizer (30);

(concerning claims 13 and 20)

- a liquid crystal display element (20) for controlling polarization of

projected light projected from the reflective polarizer (30), so that the major axis direction of a pixel must be arranged approximately parallel to a direction wherein the linearly polarized light component of the projected light projected from the illumination device (51,53,54,56) is high, in order to obtain maximum light transmittance;

- a screen (10AA) arranged at an upper portion of the liquid crystal display element (Fig.32), and the viewing angle is widened by the screen (10AA) (page 5, lines 5-6).

AAPA does not explicitly disclose that the polarized light transmission axis of the reflective polarizer is adjusted so as to be substantially perpendicular or substantially parallel to a control axis of the light control element. (Note: the "a control axis of the light control element" can be any light control axis such as the direction of a light reflection, light transmission or light birefringence as long as a light being controlled).

However, Weber discloses (col.9, lines 43-67; Fig.11) that an optical structured layer (113) having structure surface (112) (that is a light control element, because the function is to control light), and a reflective polarizer (116) to make up a brightness enhanced reflective polarizer (110), and the light transmitted by the optical structure layer (113) passes through the reflective polarizer (116) at near normal angles (perpendicular to the reflective polarizer 116), so that is a polarized light transmission axis of the reflective polarizer to be adjusted substantially perpendicular to a control axis of the light control element such as a light transmission axis of the optical structure layer (113), so as to

enhance the brightness and to achieve an adequate display contrast. Weber also discloses (col.8, line 44 – col.9, line 27;Figs.9, 10) that the light has a correct polarization to match the transmission axis of the polarizer (rear polarizer of the LCD) so as to make more efficient use of the light made available by optical cavity (140) (illumination device)). Therefore, the polarized light transmission axis of the reflective polarizer is parallel to a major axis direction of a pixel, so as to achieve more efficient light usage.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such reflective polarizer wherein the polarized light transmission axis of the reflective polarizer is adjusted as claimed in claims 1, 13 and 20 for achieving maximum light transmittance so as to enhance the brightness and efficient light usage.

3. Claims 2-3,5-7,10,12,14,17-18 and 22 rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Weber as applied to claims 1,13 and 20 above, and further in view of US 5,587,816 (Gunjima et al).

Claims 2-3, lacking limitation is such that the polarized light transmission axis of the reflective polarizer is approximately parallel to a major axis direction of a pixel, and the reflective polarizer having a light directivity in a minor axis direction of the pixel, and having screen to broaden projected light.

However, Gunjima discloses (col.5, lines 30-41) that the polarizing sheet provided on the light-incident side of the liquid crystal display element, such that the transmittance thereof is maximized to the **P** polarized light component which is emitted from the polarized light separator. Gunjima also discloses (col.3, lines

11-15 and col.2, lines 27-31) that the **S** polarized light component is reflected and is reused. Gunjima also indicates (col.5, lines 36-41) that an average direction of an optical axis of polarization of a light ray emitted from the flat light guide in the flat illumination device approximately agrees with the optical axis of polarization of the polarizing sheet on the light-incident side of the liquid crystal display element, i.e., the polarized light transmission axis of the reflective polarizer is approximately in parallel with a major axis direction of pixel of the liquid crystal display element (because the **P** polarized light is transmitted), so as to obtain a maximized transmittance. The optical axis of the **S** polarized light component is perpendicular to the optical axis of the **P** polarized light component, and the minor axis direction of the pixel is perpendicular to the major axis direction of the pixel. Therefore, the reflective polarizer must have a light directivity in a minor axis direction of the pixel. AAPA discloses (page 5, lines 5-6) that a viewing angle is widened by a screen (10AA).

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such polarizer and screen as claimed in claims 2-3 for achieving maximized transmittance and widen the viewing angle.

Claim 5, AAPA discloses (page 4, lines 23-25; Fig.32) that a screen (10AA) has transparent portions in the shape of quadranglar pyramid at the displaying plane side and black absorbing bodies covering the intervals therebetween, i.e., a screen composed to absorb external light (because the black absorbing bodies absorb light) and to transmit projected light from the illumination device (because the transparent portions transmit light).

Claims 6, and 14, AAPA discloses (page 6, lines 10-20; Fig.35) that in the light control element (40), generally, PET (polyethylene terephthalate) film having a birefringence material is used. So that the PET film is a birefringence medium, and that is arranged between the illumination device (51,53,54,56) and the light control element (40).

Claims 7,18, and 22, AAPA discloses (page 4, lines 18-22; Fig.32) that the liquid crystal layer (13) is interposed between two transparent substrates (11A,11B) and two polarizers are arranged on either side thereof.

Still lacking limitation is such that using absorption polarizer.

However, Gunjima discloses (col.17, lines 36-67: Fig.1) that a liquid crystal display element using a pair of absorbing type organic polarizing plates (9, 10), so as to increase the contrast ratio.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a pair of absorption type polarizers as claimed in claims 7, 18 and 22 for increasing the contrast ratio.

Claims 10 and 17, AAPA discloses (Fig.37) that the reflective color selective layer corresponding to the pixel of the liquid crystal element to display a color image.

Claim 12, AAPA discloses (Figs.37, 38) that a strip direction of the reflective color selective layer (506 or 512) coincides with an axis in a scattering direction of the screen so as to enhance the brightness of the color display.

4. Claims 8, 15, 21 and 26, 30, 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Weber as applied to claims 1, 13 and 20 above, and further in view of US 5,712,694 (Taira et al).

Claims 8, 15 and 21, lacking limitation is such that the illumination device in a liquid crystal display device.

However, Taira discloses (col.18, lines 39-63; Fig.21) that an illumination device comprising:

- light-guiding plane (1601) (a flat waveguide) having a front plane and a rear plane, the front plane constituting a light projecting plane, the rear plane having V-shape grooves (1606), i.e., a numerous depressed plane, protruded planes or steps and having respective slight declined planes;
- light source (1605) arranged at adjacent to the light guide (1601);
- reflector (1602) arranged at the rear plane of the light guide (1601);
- the projected light from the light source (1605) is propagated in the light guide (1601) and projected from the light projecting plane of the light guide (1601);
- the light is reflected by the reflection face of the V-shape grooves (1606), such that making the reflecting face as a mirror face to increase the light reflectance as the mirror face having a higher reflectance.

Taira indicates (col.8, lines 18-27) that the light efficiently used as

illumination light so as to increase the light utilization efficiency and to improve the display brightness for use in a liquid crystal panel.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange an illumination device as claimed in claims 8, 15 and 21 for increasing the light utilization efficiency and improving the display brightness.

Claims 26,30 and 34, lacking limitation is such that forming stripes declined planes on the reflector substantially parallel to a major axis direction of a pixel.

However, Taira discloses (Fig.21) that such stripe of a declined planes on the reflector (1602), and the stripes of the reflector parallel to the major axis of the pixel would enhance the reflectance and increase the brightness, and that would have been at least obvious for achieving a higher luminous reflectance.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to form strips declined planes on the reflector as claimed in claims 26,31and 34 for achieving a higher luminous reflectance so as to improve the display brightness.

5. Claims 9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Weber as applied to claims 1, 13 and 20 above, and further in view of US 6,101,032 (Wortman et al).

Claims 9 and 16, lacking limitation is such that the light control element is an isotropic medium or a uniaxial birefringent medium.

However, Wortman discloses (col.9, lines 24-67; col.13, line 59- col.14, line 2) that the reflectivity varies as a function of incident angle for isotropic materials, i.e., the light would be controlled by using the isotropic medium. This principle describes the behavior of uniaxially birefringent system that can be applied to create multilayer stacks having the desired optical effect for a wide variety of circumstances and applications.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use isotropic medium or uniaxial birefringent medium as the light control element as claimed in claims 9 and 16 for achieving the desired optical effect in various applications.

6. Claims 11 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 5, 587,816 (Gunjima et al).

Claims 11 and 19, AAPA discloses (background of the invention in the specification; conventional liquid crystal display device of Fig. 35) that a liquid crystal display device comprising:

- an illumination device (51,53,54,56) ;
- a light control element (40) arranged at a projected light side of the illumination device;
- a reflective polarizer (30) arranged at an upper portion of the light control element (40);
- a liquid crystal display element (20) for controlling polarization of projected light projected from the reflective polarizer (30);

- a screen (10AA) arranged at an upper portion of the liquid crystal display element (Fig.32).

AAPA does not explicitly disclose that a liquid crystal layer interposed between a pair of transparent substrates, and between a pair of absorption polarizer, and the projected light having an angle range for the brightness become ½ of a peak value satisfies a certain relationship.

However, Gunjima discloses (col.12, line 11 – col.13, line 44; Fig.1) that a liquid crystal display (11) disposed between a pair of absorbing polarizers (9,12), and the liquid crystal display must have a pair of transparent substrate for transmit light and using the light polarization to increase the transmittance so as to increase the brightness. Gunjima also discloses (co.7, line 35 – col.12, line 10) that the polarization function of the multi-layer structure operates most effectively when the angle of incident is at Brewster's angle, and the function of sending the light which is incident on the edge portion of the light guide to the inside of the light guide (illumination device) is determined in accordance with the material employed, and Gunjima discloses (col.10, lines 20-40) that a total reflection angle $\theta_c = \sin^{-1}(1/n) = 42.2°$.

Although Gunjima does not disclose the same relationship as claimed, but the relationship as claimed is to define the projected light having an angle range for the brightness become ½ of a peak value and the angle range is determined by the material employed, that is in order to improve the transmittance. Gunjima indicates (col.11, lines 9-18) that it is important to control the light emitted from the light guide, and it is preferable that the angle of light incident on the polarized

light separator is provided with a maximum value at Brewster's angle of the polarized light separator, and the light quantity is substantially concentrated on Brewster's angle, so as to improve the illuminance.

Therefore, according to the principle of the Brewster's angle, it would have been obvious to those skilled in the art at the time the invention was made to find an angle range wherein a brightness becomes ½ of a peak value satisfies a relation as claimed in claims 11 and 19 for improving the illuminance so as to increase the display brightness.

7. Claims 25, 29 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 6,025,897 (Weber et al) and US 5,986,723 (Nakamura et al).

Claims 25, 29 and 33, AAPA discloses (background of the invention in the specification; conventional liquid crystal display device of Fig. 35) that a liquid crystal display device comprising:

- an illumination device (51,53,54,56) ;
- a light control element (40) arranged at a projected light side of the illumination device;
- a reflective polarizer (30) arranged at an upper portion of the light control element (40);
- a liquid crystal display element (20) for controlling polarization of projected light projected from the reflective polarizer (30); and the major axis direction of a pixel must be arranged approximately parallel to a direction wherein the linearly polarized light component of

projected light projected from the illumination device (51,53,54,56) is high, so as to obtain a maximum light transmittance;

- a screen (10AA) arranged at an upper portion of the liquid crystal display element (Fig.32);
- the light control element (40) is the only light control element arranged between the illumination device (51,53,54,56) and the reflective polarizer (30) (Fig.35).

AAPA does not explicitly disclose that the polarized light transmission axis of the reflective polarizer is adjusted so as to be substantially perpendicular or substantially parallel to a control axis of the light control element. (Note: the "a control axis of the light control element" can be any light control axis such as the direction of a light reflection, light transmission or light birefringence as long as a light being controlled); and the polarized light transmission axis of the reflective polarizer is approximately parallel to a major axis direction of a pixel, and a ratio of a length of the pixel on the major axis direction to a length of the pixel in the minor axis direction is substantially 3:1.

However, Weber discloses (col.9, lines 43-67; Fig.11) that an optical structured layer (113) having structure surface (112) (that is a light control element, because the function is to control light), and a reflective polarizer (116) to make up a brightness enhanced reflective polarizer (110), and the light transmitted by the optical structure layer (113) passes through the reflective polarizer (116) at near normal angles (perpendicular to the reflective polarizer 116), so that is a polarized light transmission axis of the reflective polarizer to be

adjusted substantially perpendicular to a control axis of the light control element such as a light transmission axis of the optical structure layer (113), so as to enhance the brightness and to achieve an adequate display contrast. Weber also discloses (col.8, line 64 – col.9, line 27;Figs.9, 10) that the light has a correct polarization to match the transmission axis of the polarizer (rear polarizer of the LCD) so as to make more efficient use of the light made available by optical cavity (140)(illumination device)). Therefore, the polarized light transmission axis of the reflective polarizer is parallel to a major axis direction of a pixel, so as to achieve more efficient light usage.

Still lacking limitation is such that a ratio of a length of the pixel on the major axis direction (same meaning as the length of the pixel) to a length of the pixel in the minor axis direction (same meaning as the breadth of the pixel) is substantially 3:1.

However, Nakamura discloses (col.1, line 66 – col.2, line 53;Fig.17) that a structure of a one-plate projector type liquid crystal display device in which the pixel length and breadth ratio is 3:1, and such structure is less expensive and its definition is much higher.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to adjust the polarized light transmission axis of the reflective polarizer and to arrange the pixel having a ratio of a length in the major axis direction to a length in the minor axis direction as claimed in claims 25,29 and 33 for achieving more efficient light usage and higher definition display.

Response to Arguments

8. Applicant's arguments filed on May 14, 2004 have been fully considered but they are not persuasive.

Applicant's arguments are as follows:

1) Figs 32-39 are Applicant's disclosure that cannot be used in the rejection.

2) A single light control element is arranged between the illumination device and the reflective polarizer as the essential feature of the claims 1,13 and 20.

3) The references completely silent as to whether the polarized light transmission axis is perpendicular or parallel to the control axis of light control element.

4) The references do not disclose the relationship of the projected angle and the ration of the pixel.

Examiner's responses to Applicant's arguments are as follows:

1) Figs. 32-39 in the specification described that are conventional liquid crystal display structure, and these conventional figures constitute as prior art. When applicant states that something is prior art, it is taken as being available as prior art against the claims. Admitted prior art can be used in obviousness rejection (See MPEP 2129).

2) The prior art of record such as the AAPA in Fig.35 shows that a light control element (40) is the only (single) light control element arranged between the illumination device (51,53,56) and the reflective polarizer (30). Other

references such as the reference Weber also show (such as Figs.10,11) an optical structure layer (113) (single light control element) between the illumination device and the reflective polarizer.

3) The references Gunjima (col.5, lines 30-41) and Weber (col.8, line 44 – col.9, line 67;Figs.9, 10) are not silent as to whether the polarized light transmission axis is perpendicular or parallel to the control axis of the light control element but rather show and disclose that the polarized light transmission axis of the reflective polarizer is adjusted so as to enhance the brightness as adjusting the polarized light transmission axis is perpendicular or parallel to the control axis of light control element as the explanation above.

4) The references Gunjima also discloses a principle to control the light emitted from the light guide, and the skilled in the art would be benefit from the prior art to find the relationship. The reference Nakamura discloses the ratio of the pixel length and breadth, and the skilled in the art would be benefit from the prior art to use such ratio for the pixel.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory

period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (571) 272-2299. The examiner can normally be reached on M-T 8:00 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mike Qi
May 21, 2004

TARIFUR R. CHOWDHURY
PRIMARY EXAMINER